

A low dose of albuterol by metered-dose inhaler with a spacer was as effective as higher doses by metered-dose inhaler or low doses by nebulizer in children with mild acute asthma

QUESTION

In children with mild acute asthma, is albuterol (Salbutamol) delivered by a metered-dose inhaler (MDI) with a spacer (standard low dose or higher, weight-adjusted dose) as effective as albuterol delivered by a nebulizer?

DESIGN AND SETTING

Randomized, blinded, controlled trial in a hospital emergency department in Canada.

PATIENTS

Participants were 90 children aged 5 to 17 years (mean: 9.2 years; mean baseline forced expiratory volume in 1 second [FEV₁]: 62.8%) who presented with acute asthma exacerbation between 8 AM and 10 PM, could reliably perform pulmonary function testing, and had a baseline FEV₁ of 50% to 79% of the predicted value. Exclusion criteria included the first wheezing episode, the use of albuterol within 4 hours, concurrent cardiopulmonary disease, and hypersensitivity to albuterol.

INTERVENTION

Thirty children were allocated to a standard low dose of albuterol by MDI with a clear plastic 140-mL spacer device with a mouthpiece (2 puffs, 100 µg per puff); 30 children were allocated to a higher, weight-adjusted dose of albuterol by MDI with a spacer (6-10 puffs [>100 µg per puff], depending on weight). The MDIs were shaken between each puff, and the children took five to six normal breaths through the mouthpiece between each puff. Thirty children were allocated to albuterol (0.15 mg/kg) by jet nebulizer with a tight-fitting mask. Albuterol mixed with 3 mL of normal saline solution was given by the nebulizer with an oxygen flow of 6 to 8 L/min over 15 to 20 minutes. To ensure patient blinding, each child used two MDIs and a nebulizer (the allocated treatment dose and two placebo doses).

MAIN OUTCOME MEASURES

Primary outcome was percentage of predicted FEV₁ measured with a handheld spirometer. Secondary outcomes included respiratory rate, heart rate, oxygen saturation (room air), and scores for accessory muscle, wheezing, and dyspnea. Outcomes were assessed before treatment and 30, 60, and 90 minutes after treatment.

MAIN RESULTS AND CONCLUSION

Analysis was by intention to treat. The three groups had similar mean changes from baseline to 90 minutes for FEV₁ (P=0.12), respiratory rate (P=0.98), oxygen saturation, and scores for accessory muscle (P=0.58), wheezing (P=0.73), and dyspnea (P=0.39). Children in the nebulizer group had a higher mean increase in heart rate than children in the two MDI groups (increase of 12.9 beats per minute vs 3.4 for high-dose MDI and 2.6 for low-dose MDI; P=0.005). In children with mild acute asthma, a standard low dose of albuterol by MDI with a spacer was as effective as higher, weight-adjusted doses delivered by MDI with a spacer or low doses delivered by a nebulizer.

Commentary

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Guidelines from the US National Asthma Education and Prevention Program Expert Panel Report indicate that equivalent bronchodilation can be obtained with an MDI with a spacer as with continuous nebulizer treatment.¹ This study by Schuh and colleagues adds to the increasing evidence that children with mild asthma derive similar clinical benefit from bronchodilators delivered by an MDI with a spacer or by a nebulizer. A recent review of 13 trials in adults and children concluded that MDIs with spacers were at least as effective as nebulizers for beta-agonist administration, and in children, resulted in shorter stays in emergency departments and lower pulse rates.²

Blinding the children to which treatment they received and the research nurses who measured the outcomes increase the trustworthiness of the findings. No description of how the assessment scores (wheezing, accessory, and dyspnea) were derived limits the interpretation of these data. However, the main research question is answered by improvements in a standardized measure (FEV₁).

The results are relevant for advanced practice nurses who manage asthma in children and adolescents in emergency departments, urgent care centers, or specialty clinics. Matching treatment strategies in the acute care setting with those used at home can increase family compliance with the treatment plan³ by allowing nurses to assess family and child techniques, demonstrate proper techniques and answer questions.

1 US Department of Health and Human Services. *Practical guide for the diagnosis and management of asthma*. Bethesda (MD): National Heart, Lung, and Blood Institute; 1997.

2 Cates CJ. Holding chambers versus nebulizers for β -agonist treatment of acute asthma. *Cochrane Rev* 13 February 1998. Oxford: Update software.

3 Newhouse MT. Asthma therapy with aerosols: are nebulizers obsolete? A continuing controversy. *J Pediatr* 1999;135:5-8.

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J Pediatr 1999;135:22-27.

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Funding: Physicians' Services Inc; Trudell Medical; Hospital for Sick Children Foundation; and the Department of Pediatrics, Hospital for Sick Children, Toronto, Ontario, Canada.

This paper was originally published in *Evidence-Based Nursing* 2000;3:12.